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REMARKS

Claims 1-10 are pending in the application.

Claims 1-6 have been allowed.

Claims 9 and 10 have been rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite.

Specifically, the Examiner criticizes the following language in Claims 9 and 10: “glass powder having lower transition temperature having a glass transition temperature.” He suggests that “having lower transition temperature” be deleted.

Applicants have deleted the phrase “having lower transition temperature.” Applicants submit that the claims are clear and definite and respectfully request that the Examiner reconsider and withdraw the § 112 rejection.

The Examiner has objected to the specification for informalities. The Examiner asserts that the glass used in the instant invention is not defined by a composition and therefore does not provide one of ordinary skill in the art with sufficient information to reproduce the instant invention. The Examiner criticizes the specification on the basis that it refers to trade names for certain chemical materials, the composition of which may change over time. Therefore, the Examiner requests that Applicants supply product information sheets for the trade names and amend the specification to include the composition.

Applicants submit herewith data sheets showing the properties of ASF-1340. Applicants have also amended the specification to recite the chemical composition of ASF-1340 used in the examples. Applicants submit that the specification is clear and definite and fully enabled and

Appln. No.: 09/832,209
Amendment under 37 C.F.R. § 1.111

Q64055

therefore, Applicants respectfully request that the Examiner reconsider and withdraw the rejection.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: July 26, 2004



ASF/ATG Powder Glass for Electronics

POWDER GLASS

AP Dielectric Glass Pastes for Thick-film Printing

GLASS PASTE

2004.April version

ASAHI GLASS CO., LTD. Electronic Materials & Products General Div.
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ASF Powder Glass for Hermetic Seal

Code	Glass Type	Firing Condition	Thermal Expansion Coeff.	Viscosity Property (DTA)			Electrical Property			Particle Property			
				Temp.-Time (°C-min)	Point (°C)	Transformation Softening (X10 ⁻³ /°C) 25~300°C	Point (°C)	Resistance log ρ (Ω·cm) 150°C	Dielectric Constant ε 1MHz, 25°C	Average Particle Size (D50) (μm)	Sieving Size Mesh Pass (μm)	Color (After Firing)	Lead Free or Contd.
ASF110	SiO ₂ ·BaO·R ₂ O	980~5	48	2.3	510	715	14	5	20	5.5	—	150	—
ASF11F	SiO ₂ ·BaO ₂ ·R ₂ O	980~5	48	2.3	510	715	14	5	20	5.5	—	150	—
ASF200R	SiO ₂ ·R ₂ O	980~5	92	2.6	440	650	12	7	20	10.0	—	150	—
ASF200G	SiO ₂ ·R ₂ O	980~5	92	2.6	440	650	12	7	20	—	—	150	—
ASF208	SiO ₂ ·R ₂ O	980~5	92	2.6	440	650	12	7	20	10.0	—	150	—
ASF208G	SiO ₂ ·R ₂ O	980~5	92	2.6	440	650	12	7	20	—	—	150	—
ASF700G	SiO ₂ ·R ₂ O	980~5	99	2.6	505	690	12	7	20	10.0	—	150	—
ASF700G	SiO ₂ ·R ₂ O	980~5	99	2.6	505	690	12	7	20	—	—	100	White

Characteristics

● Powder glass suitable for various metallic materials including iron, ferro-nickel alloys, Kovar, etc.

● Crystalline glass powder has outstanding heat-resistance properties.

● Non-alkaline glass is also available for sealing Kovar.

● Suitable as glass powder, granulated powder and tablets.

● Granulated organic binders provide superior burn-out property.

ASF Powder Glass for Low Temperature Sealing

Code	Glass Type	2004 April Version	Thermal Expansion Coeff. (X10 ⁻³ /°C) 25~300°C	Specific Transformation Point (°C)	Viscosity Property (DTA)			Electrical Property			Particle Property			
					Point (°C)	Transformation Softening (X10 ⁻³ /°C)	Crystallization (°C)	Volume Resistance log ρ (Ω·cm) 150°C	Dielectric Constant ε 1MHz, 25°C	Average Particle Size (D50) (μm)	Particle Size (Center Value) (μm)	Sieving Size Mesh Pass (μm)	Color (After Firing)	Lead Free or Contd.
ASF1200	B ₂ O ₃ ·PbO	450~5	73	5.8	320	380	10	14	50	5.0	10.3	150	Black	Contd.
ASF1200M	B ₂ O ₃ ·PbO	450~10	72	5.8	320	380	10	14	50	4.0	—	150	Black	Contd.
ASF1295	B ₂ O ₃ ·SiO ₂ ·PbO	450~10	83	5.6	335	405	—	—	—	6.2	—	150	White	Contd.
ASF1328	B ₂ O ₃ ·Pb _{0.7} ZnO	440~35	93	5.9	320	400	515	—	—	5.8	—	100	Black	Contd.
ASF1307	B ₂ O ₃ ·ZnO	440~35	99	6.5	320	400	510	10	23	100	6.0	—	100	Yellow
ASF1307F	B ₂ O ₃ ·Pb _{0.7} ZnO	440~20	97	6.5	320	400	510	10	23	100	1.5	325	Yellow	Contd.
ASF1310	B ₂ O ₃ ·SiO ₂ ·PbO	520~20	54	4.9	345	450	—	—	—	5.5	8.7	100	Black	Contd.

ASF Powder Glass for Mold

Code	Glass Type	Firing Condition	Thermal Expansion Coeff. (X10 ⁻³ /°C) 25~300°C	Specific Transformation Point (°C)	Viscosity Property (DTA)			Electrical Property			Particle Property			
					Point (°C)	Transformation Softening (X10 ⁻³ /°C)	Crystallization (°C)	Volume Resistance log ρ (Ω·cm) 150°C	Dielectric Constant ε 1MHz, 25°C	Average Particle Size (D50) (μm)	Particle Size (Center Value) (μm)	Sieving Size Mesh Pass (μm)	Color (After Firing)	Lead Free or Contd.
ASF1400	B ₂ O ₃ ·ZnO	630~5	48	3.9	535	650	14	8	30	7.3	—	100	White	Contd.
ASF1405	B ₂ O ₃ ·ZnO	630~5	48	3.8	480	650	—	—	—	4.5	—	200	White	Contd.

Characteristics

● A low-alkali glass with excellent insulating properties and good sealing to silicon chips.

ASF Powder Glass for Shadowmask Coating

Code	Glass Type	Firing Condition	Thermal Expansion Coeff. (X10 ⁻³ /°C) 25~300°C	Specific Transformation Point (°C)	Viscosity Property (DTA)			Electrical Property			Particle Property			
					Point (°C)	Transformation Softening (X10 ⁻³ /°C)	Crystallization (°C)	Volume Resistance log ρ (Ω·cm) 150°C	Dielectric Constant ε 1MHz, 25°C	Average Particle Size (D50) (μm)	Particle Size (Center Value) (μm)	Sieving Size Mesh Pass (μm)	Color (After Firing)	Lead Free or Contd.
ASF1260	SiO ₂ ·PbO	730~10	47	3.5	320	480	650	—	—	2.8	—	325	White	Contd.

ASF Powder Glass for Shadowmask Coating

Code	Glass Type	Firing Condition	Thermal Expansion Coeff. (X10 ⁻³ /°C) 25~300°C	Specific Transformation Point (°C)	Viscosity Property (DTA)			Electrical Property			Particle Property			
					Point (°C)	Transformation Softening (X10 ⁻³ /°C)	Crystallization (°C)	Volume Resistance log ρ (Ω·cm) 150°C	Dielectric Constant ε 1MHz, 25°C	Average Particle Size (D50) (μm)	Particle Size (Center Value) (μm)	Sieving Size Mesh Pass (μm)	Color (After Firing)	Lead Free or Contd.
ASF202	B ₂ O ₃ ·ZnO·PbO	440~35	90	8.5	320	400	12.5	40	400	4.0	—	150	Black	Contd.

ASF Powder Glass for Shadowmask Coating

Code	Glass Type	Firing Condition	Thermal Expansion Coeff. (X10 ⁻³ /°C) 25~300°C	Specific Transformation Point (°C)	Viscosity Property (DTA)			Electrical Property			Particle Property			
					Point (°C)	Transformation Softening (X10 ⁻³ /°C)	Crystallization (°C)	Volume Resistance log ρ (Ω·cm) 150°C	Dielectric Constant ε 1MHz, 25°C	Average Particle Size (D50) (μm)	Particle Size (Center Value) (μm)	Sieving Size Mesh Pass (μm)	Color (After Firing)	Lead Free or Contd.
ASF202	B ₂ O ₃ ·ZnO·PbO	440~35	90	8.5	320	400	12.5	40	400	4.0	—	150	Black	Contd.

ASF Powder Glass for Shadowmask Coating

● With a conductive frit additive, this frit makes it possible to control the static electrical characteristics of coated substances.

ASF Powder Glass for Binder (Lead Contd.)

Code	Glass Type	Firing Condition	Thermal Expansion Coeff. (X10 ⁻⁷ /°C)	Specific Gravity (°C-min)	Viscosity Property (DTA)			Electrical Property			Particle Property			Lead Free or Contd.	
					Point (°C)	Transformation Point (°C)	Crystallization Point (°C)	Volume Resistance log ρ (Ω·cm)	Dielectric Constant 1MHz, 25°C	Average Particle Size (X10 ⁻⁴) tan δ (MHz, 25°C) μm	Particle Size (Center Value) (D50) μm	Sieving Size Mesh Pass	Color (After Firing)		
ASF1216	SiO ₂ ·PbO·Bi ₂ O ₃	600~10	64	4.3	475	595	-	-	-	-	1.8	325	Yellow-white	Contd.	
ASF1217	SiO ₂ ·PbO·Bi ₂ O ₃	800~10	55	4.1	470	600	-	-	-	-	2.0	325	Yellow-white	Contd.	
ASF1231	SiO ₂ ·PbO	650~15	73	4.5	480	535	590	-	-	-	2.0	-	-	Contd.	
ASF1280	SiO ₂ ·Bi ₂ O ₃ ·PbO	600~15	62	5.1	430	340	380	-	-	-	1.5	-	-	Contd.	
ASF1290	SiO ₂ ·Bi ₂ O ₃ ·PbO	440~10	107	6.2	440	400	-	-	-	-	4.5	-	-	Contd.	
ASF1291	SiO ₂ ·Bi ₂ O ₃ ·PbO	440~10	106	6.4	380	445	-	-	-	-	3.9	-	-	Contd.	
ASF1320	Bi ₂ O ₃ ·PbO	500~15	92	5.8	380	445	-	-	-	-	2.0	-	-	Contd.	
ASF1340	Bi ₂ O ₃ ·Bi ₂ O ₃ ·PbO	550~10	77	5.2	420	505	14	13	18	2.0	1.2	325	Gray	Contd.	
ASF1340	Bi ₂ O ₃ ·PbO	520~10	79	6.2	345	420	515	10	20	50	4.0	-	-	Contd.	
ASF1370	SiO ₂ ·Bi ₂ O ₃ ·PbO	650~15	94	3.8	485	615	14	8	10	2.1	8.1	150	Green	Contd.	
ASF1373	SiO ₂ ·PbO	700~15	83	4.1	550	595	-	-	-	-	2.2	325	Pale yellow	Contd.	
ASF1380	SiO ₂ ·PbO	810~5	62	3.8	555	685	-	-	-	-	2.4	325	Pale yellow	Contd.	
ASF1381	SiO ₂ ·Bi ₂ O ₃ ·PbO	800~10	60	3.5	555	700	-	-	-	-	2.0	1.5	325	Yellow	Contd.
ASF1460	Bi ₂ O ₃ ·ZnO	720~10	39	3.9	520	625	685	-	-	-	7.0	20.3	100	White	Contd.
ASF1500	SiO ₂ ·Al ₂ O ₃ ·RO	850~15	60	3.0	680	805	14	11	10	4.8	10.7	250	Yellow-green	Contd.	
ASF1506	SiO ₂ ·Al ₂ O ₃ ·RO	800~15	63	3.9	610	705	-	-	-	-	2.3	325	White	Contd.	
ASF1535	SiO ₂ ·ZnO·PbO	720~15	55	3.5	555	685	-	-	-	-	1.7	325	Pale yellow	Contd.	
ASF1540	SiO ₂ ·PbO·RO	850~10	52	3.1	615	770	-	-	-	-	1.8	-	-	Contd.	
ASF1550	SiO ₂ ·ZnO·PbO	550~15	47	4.8	450	515	540	14	11	10	2.1	325	White	Contd.	
ASF1580	SiO ₂ ·Ba ₂ O ₃ ·PbO	750~10	59	3.6	530	680	-	-	-	-	1.3	325	White	Contd.	
ASF1592	SiO ₂ ·Ba ₂ O ₃ ·PbO	850~10	50	3.6	575	750	945	-	-	-	1.3	325	White	Contd.	

ASF Powder Glass for Binder (Lead Free)

Code	Glass Type	Firing Condition	Thermal Expansion Coeff. (X10 ⁻⁷ /°C)	Specific Gravity (°C-min)	Viscosity Property (DTA)			Electrical Property			Particle Property			Lead Free or Contd.
					Point (°C)	Transformation Point (°C)	Crystallization Point (°C)	Volume Resistance log ρ (Ω·cm)	Dielectric Constant 1MHz, 25°C	Average Particle Size (X10 ⁻⁴) tan δ (MHz, 25°C) μm	Particle Size (Center Value) (D50) μm	Sieving Size Mesh Pass	Color (After Firing)	
ASF1100	Bi ₂ O ₃ ·Bi ₂ O ₃	460~30	113	6.4	380	440	520	-	-	-	5.2	150	Brown-yellow	Free
ASF1100B	Bi ₂ O ₃ ·Bi ₂ O ₃	460~30	107	6.3	380	460	540	-	-	-	1.1	325	Yellow	Free
ASF1108	Bi ₂ O ₃ ·ZnO·Bi ₂ O ₃	380~5	65	5.1	440	554	-	-	-	-	2.8	325	Green	Free
ASF1131	Bi ₂ O ₃ ·ZnO·Bi ₂ O ₃	600~5	88	4.1	505	595	845	-	-	-	3.3	325	Yellow	Free
ASF1495	SiO ₂ ·ZnO·RO	850~15	73	3.7	600	700	810	-	-	-	1.8	325	White	Free
ASF1560	SiO ₂ ·ZnO·RO	850~10	73	3.3	645	753	800	-	-	-	1.7	325	White	Free
ASF1561	SiO ₂ ·ZnO·RO	850~10	72	3.7	655	805	895	14	20	9	1.6	325	White	Free
ASF1700	SiO ₂ ·ZnO·RO	850~15	80	3.1	720	880	915	14	9	20	1.5	325	White	Free
ASF1710	SiO ₂ ·Al ₂ O ₃ ·RO	1050~15	65	2.7	670	805	-	-	-	-	6.0	14.9	100	White
ASF1780	SiO ₂ ·Ba ₂ O ₃ ·RO	850~15	52	2.5	635	780	-	-	-	-	3.0	325	Gray	Free
ASF1800	SiO ₂ ·ZnO·RO	900~30	61	3.3	640	795	-	-	-	-	1.9	325	White	Free
ASF1881	SiO ₂ ·Ba ₂ O ₃ ·ZnO	800~10	68	3.5	490	580	715	-	-	-	3.0	325	White	Free
ASF1881F	SiO ₂ ·Ba ₂ O ₃ ·ZnO	810~10	63	3.5	485	580	690	-	-	-	1.5	325	White	Free
ASF1893AB	SiO ₂ ·Ba ₂ O ₃ ·ZnO	800~10	64	3.2	460	560	600	-	-	-	4.0	325	Brown	Free
ASF1895	SiO ₂ ·Ba ₂ O ₃ ·RO	600~10	95	3.6	480	580	-	-	-	-	1.5	325	White	Free
ASF1898	SiO ₂ ·Ba ₂ O ₃ ·RO	600~10	108	3.4	440	525	-	-	-	-	4.5	200	White	Free
ASF1898B	SiO ₂ ·Ba ₂ O ₃ ·RO	600~10	43	4.7	480	570	-	-	-	-	1.1	200	White	Free
ASF1899	SiO ₂ ·Ba ₂ O ₃ ·RO	850~15	87	3.4	438	525	-	-	-	-	2.0	325	White	Free
ASF1900	SiO ₂ ·Ba ₂ O ₃ ·RO	700~15	90	3.7	620	720	-	-	-	-	1.0	100	White	Free
ASF1901B	SiO ₂ ·Ba ₂ O ₃ ·RO	700~15	90	3.7	585	673	-	-	-	-	1.2	325	White	Free
ASF1900	SiO ₂ ·Ba ₂ O ₃ ·RO	600~10	104	2.6	440	580	-	-	-	-	4.0	100	Gray	Free
ASF1900B	SiO ₂ ·Ba ₂ O ₃ ·RO	600~10	104	2.6	450	570	-	-	-	-	1.4	325	Brown	Free
1098	Bi ₂ O ₃ ·ZnO·Bi ₂ O ₃	600~10	54	5.5	440	520	550	-	-	-	3.0	100	Yellow	Free
1099	Bi ₂ O ₃ ·ZnO·ZnO	600~10	43	4.7	480	570	-	-	-	-	3.5	100	Yellow	Free
1191	SiO ₂ ·Ba ₂ O ₃ ·RO	850~15	50	3.7	580	657	810	-	-	-	25.0	150	White	Free
R273	SiO ₂ ·RO	1000~30	74	2.8	395	505	-	-	-	-	6.0	150	White	Free
C153M	SiO ₂ ·ZnO·RO	850~10	109	3.8	670	800	910	-	-	-	9.0	100	White	Free
Characteristics														
● Widely used as a binder for electrodes and resistors in thick-film printed circuits.														
● We can supply other grades and specifications of glass (grain diam., etc.) on both a prototype and a mass-production basis.														
● Available as paste.														

ASF Powder Glass for Glass-Ceramic Multilayer Substrate

Code	Glass Type	Firing Condition Temp.-Time (°C-min)	Viscosity Property (DTA)			Electrical Property Dielectric Constant ϵ 1MHz, 25°C	Average Particle Size (Center Value) (D50) (μm)	Particle Property Sieving Size Mesh Pass (After Firing)	Color	Thermal Conductivity ($\times 10^{-3}$ cal/cm \cdot sec \cdot °C)	Lead Free or Contd.
			Thermal Expansion Coeff. ($\times 10^{-7}/^{\circ}\text{C}$) 25~200°C	Specific Gravity	Transformation Point (°C)						
ASF780	SiO ₂ ·B ₂ O ₃ ·RO	900~90 25~300°C	52	2.5	535	780	-	3.0	3.8	325	Clear
ASF781	SiO ₂ ·B ₂ O ₃ ·RO	900~10 25~300°C	32	2.2	635 ¹	930	-	4	8	325	White
ASF782M	SiO ₂ ·B ₂ O ₃ ·RO	900~90 25~300°C	28	2.2	495 ¹	800	14	4	-	2.6	Free
ASF102Y	SiO ₂ ·B ₂ O ₃ ·RO	850~10 25~300°C	28	2.2	495 ¹	775	-	-	-	3.5	Free
ASF102X	SiO ₂ ·B ₂ O ₃ ·RO	850~10 25~300°C	27	2.2	500 ¹	760	-	-	-	1.3	Free
ASF102W	SiO ₂ ·B ₂ O ₃ ·RO	850~10 25~300°C	27	2.2	512 ¹	755	-	-	-	1.0	Free
ASF1880	SiO ₂ ·B ₂ O ₃ ·RO	800~60 25~300°C	37	2.2	550	785	14	5	-	0.8	Free
ASF0325V	SiO ₂ ·Al ₂ O ₃ ·MnO	900~60 25~300°C	2.7	2.7	960,990	-	-	-	-	2.6	Clear
ASF0325C	SiO ₂ ·Al ₂ O ₃ ·MnO	-	15	2.7	-	-	-	-	2.0	-	Clear
Characteristics											Free

● These are the low dielectric constant borosilicate glass suitable for the thermal expansion coefficient of silicon chips.

● ASF032V and ASF0325C are cordierite.

● Powder glass with controlled water content and grain-size distribution for green sheeting.

● We can supply other grades and specifications of glass (grain diam. etc.) on both a prototype and a mass production basis.

● Can be blended with alumina, cordierite and other ceramic powders.

¹ : Transformation point of TMA curve.

ASF Powder Glass for Alumina Substrate Glazing

Code	Glass Type	Firing Condition Temp.-Time (°C-min)	Viscosity Property (DTA)			Electrical Property Dielectric Constant ϵ 1MHz, 25°C	Average Particle Size (Center Value) (D50) (μm)	Particle Property Sieving Size Mesh Pass (After Firing)	Color	Thermal Conductivity ($\times 10^{-3}$ cal/cm \cdot sec \cdot °C)	Lead Free or Contd.
			Thermal Expansion Coeff. ($\times 10^{-7}/^{\circ}\text{C}$) 25~300°C	Specific Gravity	Transformation Point (°C)						
ASF1761	SiO ₂ ·B ₂ O ₃ ·RO	1250~60 25~300°C	69	3.0	710	910	-	-	-	325	Free
ASF1762	SiO ₂ ·B ₂ O ₃ ·RO	1250~60 25~300°C	65	2.9	765	925	-	-	5.0	325	Free

ATG Powder Glass for Ceramic sealing

Code	Type of Glass			Scaling temperature and time			Thermal Expansion			Characteristics of Glass								
	Glass Characteristics	Composition	Color	Shape	Sealing Temp. (°C)	Sealing Time (min)	Major application	X10 ⁻⁷ /°C	Range (°C)	Transition Point (°C)	Softening Point (°C)	Volume Resistivity log 10R at 250°C	Dielectric Constant R.T.1MHz	Young's Modulus GPa	Bending Strength MPa	Sieving Size Mesh Pass	Lead Free or Contd.	Other
IWF-DT430	Vitreous	PbO·BaO ₃	Black	Powder,Pre-formed	430	10	VFD·PDP	72	30-300	310	353 ¹	7.2	9.6	35.0	57	57	100	Contd.
IWF-DT430-150	Vitreous	PbO·BaO ₃	Black	Powder,Pre-formed	430	10	VFD·PDP	72	30-300	310	353 ¹	7.2	9.6	35.0	57	57	150	Contd.
IWF-TD29	Vitreous	PbO·BaO ₃	White	Powder,Pre-formed	450	15	VFD	78	30-300	316	365 ¹	6.0	9.2	20.0	40	49	100	Contd.
IWF-T5908	devitrifying	PbO·BaO ₃ ·ZnO	Black	Powder,Pre-formed	440	35	CRT	98	30-300	320	370 ¹	6.4	10.1	21.0	57	49	100	Contd.
IWF-T59	devitrifying	PbO·BaO ₃ ·ZnO	Black	Powder,Pre-formed	450	40	VFD	89	30-300	320	375 ¹	6.4	8.5	19.0	51	41	100	Contd.
IWF-230DM	Vitreous	PbO·BaO ₃	Black	Powder,Pre-formed	430	10	PDP	82	30-300	310	355 ¹	6.1	7.2	35.0	57	57	150	Contd.
MFP-2005	Vitreous	PbO·BaO ₃	Black	Powder	470	10	PDP	67	30-250	307	360 ¹	4.9 ¹	6.5	35.0	57	57	150	Contd.
MFP-2014	Vitreous	PbO·BaO ₃	Black	Powder	490	10	PDP	68	30-250	347	419 ¹	4.9 ¹	6.5	34.3	57	57	150	Contd.

¹ Hard inflection point on DTA curve

ATG Powder Glass for Ceramic sealing Additives to Ceramic substrates

Code	Type of Glass			Scaling temperature and time			Thermal Expansion			Characteristics of Glass										
	Glass Characteristics	Composition	Color	Shape	Sealing Temp. (°C)	Sealing Time (min)	Major application	X10 ⁻⁷ /°C	Range (°C)	Transition Point (°C)	Softening Point (°C)	Volume Resistivity log 10R at 250°C	Dielectric Constant R.T.1MHz	Young's Modulus GPa	Bending Strength MPa	Sieving Size Mesh Pass	Lead Free or Contd.	Other		
IWF-T187M	Vitreous	PbO·BaO ₃	Black	Powder,Pre-formed	430	10	IC package	65	30-300	308	351 ¹	5.8	9.4	12.8	71	81	150	Contd.		
IWF-C1410	Vitreous	PbO·BaO ₃	Black	Powder,Pre-formed	410	10	IC package	68	30-300	298	337 ¹	5.6	9.5	12.7	69	69	150	Contd.		
IWF-7585BF	devitrifying	PbO·BaO ₃ ·ZnO	Black	Powder,Pre-formed	450	35	CRT	78	30-300	325	370 ¹	6.1	8.3	18.9	42	52	150	Contd.		
IWF-T072	devitrifying	PbO·BaO ₃ ·ZnO	Black	Powder,Pre-formed	500	5	Insulation, Over coating	68	30-300	448	521 ¹	4.3	12.3	13.0	47	59	100	Contd.		
IWF-T077	Vitreous	PbO·BaO ₃ ·Al ₂ O ₃	White	Powder,Pre-formed	510	5	Insulation, Over coating	74	30-300	411	415 ¹	5.0	11.2	20.1	45	53	100	Contd.		
IWF-7578W	devitrifying	PbO·BaO ₃ ·ZnO	White	Powder,Pre-formed	520	60	Insulation, Over coating	78	30-300	385	440 ¹	6.2	12.0	18.3	59	49	100	Contd.		
IWF-7574	devitrifying	ZnO·BaO ₃ ·SiO ₂	White	Powder,Pre-formed	750	30	AIN Sealing	37	30-300	580	640 ¹	3.8	13.7	6.1	62	69	100	Free		
K807	Vitreous	SiO ₂ ·BaO·BaO ₃	White	Powder	750	30	Ceramic co-firing	77	30-300	638	725 ¹	3.6	7.1	100	100	100	Free	*		
K808	Vitreous	SiO ₂ ·BaO·BaO ₃	White	Powder	750	30	Ceramic co-firing	69	30-300	630	725 ¹	3.4	6.9	9.7	300	300	Free	Devitrifying Temp.: 870°C		
LS-5	devitrifying	SiO ₂ ·BaO·Li ₂ O	White	Powder	93	30-300	690	780 ¹	3.8	9.7	300	Free	Devitrifying Temp.: 775°C	300	300	Free	Devitrifying Temp.: 775°C			
K809	Vitreous	SiO ₂ ·BaO ₃ ·Al ₂ O ₃	White	Powder	106	30-300	476	553 ¹	2.9	750 ¹	2.2	10.0	4.3	—	—	—	—	—		
K810	Vitreous	SiO ₂ ·MgO·Al ₂ O ₃	White	Powder	150	30-300	520	820 ¹	2.6	750 ¹	2.6	6.0	300	300	300	Free	Devitrifying Temp.: 1000°C			
I224	Vitreous	SiO ₂ ·MgO·Al ₂ O ₃	White	Powder	52	30-300	720	820 ¹	2.6	924 ¹	2.6	6.6	300	300	300	Free	Strain Point: 674°C			
GSP523	Vitreous	PbO·BaO ₃ ·ZnO	White	Powder	44	0-300	226	440 ¹	4.4	446 ¹	5.4	446 ¹	3.4	3.8	300	300	300	Free	Deformation Point : 410°C	
GSP533	Vitreous	PbO·BaO ₃	White	Powder	90	30-300	370	703 ¹	2.5	703 ¹	2.5	556	586 ¹	3.9	3.8	300	300	300	Free	Deformation Point : 430°C
SK-231	Vitreous	PbO·BaO ₃ ·ZnO	White	Powder,Pre-formed	575	20	Paste	84	30-300	485	560 ¹	5.1	11.7	17.0	78	89	300	Free	Devitrifying Temp.: 690°C	
SK-360	devitrifying	Li ₂ O·ZnO	White	Powder,Pre-formed	580	30	Paste	67	30-300	465	549 ¹	2.8	8.1	9.0	9.0	89	300	Free	Devitrifying Temp.: 610°C	
2431	Vitreous	SnO ₂ ·ZnO·P ₂ O ₅	Pale brown	Powder	480	10	Paste	137	25-300	280	38	3.8	100	100	100	100	100	Free	Devitrifying Temp.: 620°C	
2452	devitrifying	SnO ₂ ·ZnO·P ₂ O ₅	Black	Powder	490	10	Paste	82	50-250	350	446 ¹	5.4	3.9	3.9	3.9	3.9	300	Free	Devitrifying Temp.: 654°C	
K301	Vitreous	SiO ₂ ·BaO·BaO ₃	White	Powder	800	20	Condenser paste	54	0-300	556	586 ¹	2.9	3.1	3.1	3.1	3.1	300	Free	Devitrifying Temp.: 700°C	
K303	devitrifying	SiO ₂ ·BaO·BaO ₃	White	Powder	135	30-300	370	400 ¹	3.1	440	478 ¹	2.8	3.1	3.1	3.1	3.1	300	Free	Devitrifying Temp.: 700°C	
K304	devitrifying	SiO ₂ ·BaO·BaO ₃	White	Powder	112	30-300	440	500	586 ¹	4.0	529	603 ¹	3.6	4.0	4.0	4.0	4.0	300	Free	Devitrifying Temp.: 700°C
K834	devitrifying	SiO ₂ ·BaO·ZnO	White	Powder	80	30-300	500	586 ¹	4.0	529	603 ¹	3.6	4.0	4.0	4.0	4.0	300	Free	Devitrifying Temp.: 700°C	
K835	devitrifying	SiO ₂ ·BaO ₃	White	Powder	43	30-300	520	693	757 ¹	4.1	757 ¹	4.1	4.1	4.1	4.1	4.1	300	Free	Devitrifying Temp.: 733°C	
K836	devitrifying	SiO ₂ ·MgO·TiO ₂	White	Powder	93	30-300	608	712 ¹	2.4	712 ¹	2.4	2.4	2.4	2.4	2.4	2.4	200	Free	Devitrifying Temp.: 733°C	
K837	Vitreous	SiO ₂ ·Al ₂ O ₃	White	Powder	41	30-300	760	900 ¹	2.8	450 ¹	2.8	8.6	8.6	8.6	8.6	8.6	300	Free	Devitrifying Temp.: 590°C	
J501	Vitreous	SiO ₂ ·Al ₂ O ₃	White	Powder	121	30-300	400	760	760 ¹	3.3	3.4	3.4	3.4	3.4	3.4	3.4	300	Free	Devitrifying Temp.: 590°C	
FF209	devitrifying	SiO ₂ ·Al ₂ O ₃	White	Powder	900	30	LTOC	100	30-300	700	775 ¹	3.4	3.4	3.4	3.4	3.4	300	Free	Devitrifying Temp.: 600°C	
FF202	devitrifying	SiO ₂ ·Al ₂ O ₃	White	Powder	900	30	LTOC	100	30-300	700	775 ¹	3.4	3.4	3.4	3.4	3.4	300	Free	Devitrifying Temp.: 600°C	
FF203	devitrifying	SiO ₂ ·Al ₂ O ₃	White	Powder	900	30	LTOC	100	30-300	700	775 ¹	3.4	3.4	3.4	3.4	3.4	300	Free	Devitrifying Temp.: 600°C	

¹ Hard inflection point on DTA curve² Fiber method

ATG Powder Glass for Metal sealing (Stainless steel, Kovar, Ferrite)

Code	Glass Characteristics	Type of Glass			Sealing temperature and time			Characteristics of Glass										
		Composition	Color	Shape	Sealing Temp. (°C)	Sealing Time (min)	Major application	X10 ⁻⁷ /°C Range (°C)	Transition Point (°C)	Softening Point (°C)	Density	Resistance log 10R at 250°C	Dielectric Constant	Young's Modulus GPa	Bending Strength MPa	Sieving Size Mesh Pass	Lead Free or Contd.	Other
IWF-7570	Vitreous	PbO·Bi ₂ O ₃ ·Al ₂ O ₃	White	Powder, Pre-formed	500	5	Seathed heaters	84	30-300	318	440 ¹	5.4	10.6	15.6	44	42	100	Contd.
IWF-7214	Vitreous	PbO·SiO ₂	White	Powder, Pre-formed	500	10	Seathed heaters	125	30-300	316	435 ¹	4.7	10.4	15.6	43	44	100	Contd.
IWF-T015	Vitreous	PhO·Ba ₂ O ₃	White	Powder, Pre-formed	425	5	Seathed heaters	110	30-300	316	385 ¹	6.4	8.8	22.2	39	35	100	Contd.
KF1129	Vitreous	PhO·SiO ₂	Black	Powder, Pre-formed	600	10	Ferrites Sealing	88	30-300	450	555 ¹	4.4	—	—	—	—	100	Contd.
KF1170	Vitreous	PhO·SiO ₂	Black	Powder, Pre-formed	520	10	Ferrites Sealing	101	30-300	376	485 ¹	5.5	—	—	—	—	100	Contd.
AF103	Vitreous	PbO·Bi ₂ O ₃ ·SiO ₂	Black	Powder, Pre-formed	520	10	Ferrites Sealing	97	30-300	348	418 ¹	6.2	—	—	—	—	100	Contd.
IWF-7436	Vitreous	PhO·Bi ₂ O ₃	White	Powder, Pre-formed	400	10	Stainless Steel Sealing	118	30-280	285	340 ¹	6.8	—	—	—	—	100	Contd.
K9002D	Vitreous	SiO ₂ ·Bi ₂ O ₃ ·Na ₂ O	White	Powder, Pre-formed	450	10	Kovar Sealing	60	30-300	308	348 ¹	7.2	9.8	40.0	63	57	150	Contd.
K9104	Vitreous	SiO ₂ ·Bi ₂ O ₃ ·Na ₂ O	White	Powder	1000	10	Kovar Sealing	47	0-300	510	729 ¹	2.3	—	—	—	—	100	Free
GSP507C	Vitreous	PhO·Bi ₂ O ₃	White	Powder, Pre-formed	450	10	Seathed heaters	54	0-300	490	715 ¹	2.2	—	—	—	—	100	Free
GSP550	Vitreous	PhO·Bi ₂ O ₃	Black	Powder	550	30	Ferrites Sealing	113	50-250	310	355 ¹	6.5	9.0	—	—	—	—	Contd.
GSP535	Vitreous	PhO·Bi ₂ O ₃ ·SiO ₂	White	Powder	85	30-250	Ferrites Sealing	100	50-250	340	397 ¹	6.2	—	—	—	—	—	Contd.
GSP507	Vitreous	PhO·Bi ₂ O ₃	White	Powder	450	10	Carbon Brush	85	50-300	410	468 ¹	6.0	—	—	—	—	—	Contd.
					112	50-250	310	354 ¹	6.6	—	—	—	—	—	—	300	Contd.	

¹ Third inflection point on DTA curve² Fiber method

ATG " Lead Free " Powder Glass for Low Temperature sealing

Code	Glass Characteristics	Type of Glass			Sealing temperature and time			Characteristics of Glass										
		Composition	Color	Shape	Sealing Temp. (°C)	Sealing Time (min)	Major application	X10 ⁻⁷ /°C Range (°C)	Transition Point (°C)	Softening Point (°C)	Density	Resistance log 10R at 250°C	Dielectric Constant	Young's Modulus GPa	Bending Strength MPa	Sieving Size Mesh Pass	Lead Free or Contd.	Other
FP-74 ¹	Vitreous	SnO·P ₂ O ₅	Gray	Powder	450	10	Ceramic (Alumina) Sealing	84	30-250	281	355 ¹	3.4	—	—	—	—	150	Free
FP-67 ¹	Vitreous	SnO·P ₂ O ₅	Gray	Powder	450	10	Soda-Lime Glass Sealing	81	30-250	284	345 ¹	3.4	—	—	—	—	150	Free
KF8531 ¹	Vitreous	SnO·P ₂ O ₅	White	Powder	400	10	—	140	30-250	303 ¹	4.1	—	—	—	—	150	Free	
KF9078 ¹	Vitreous	SnO·P ₂ O ₅	White	Powder	450	10	—	122	30-250	280	336 ¹	3.8	—	—	—	—	150	Free

¹ Licensed product of U.S. Patent No. 3281560. Could not be used for some application. Please contact us for further information.² Third inflection point on DTA curve

AP Overcoat Glass Paste for Hybrid IC

Code	Glass Type	Paste and Fired Glass Feature	Glass Characteristics	Paste Specific Gravity (Pa·s)	Firing Condition (°C—min.)	Thermal Expansion Coeff. (X10 ⁻⁷ /°C.)	Viscosity Property (DTA) Softening Point (°C)	Color	Electrical Property	Particle Property
AP5246	SiO ₂ ·B ₂ O ₃ ·PbO	Excellent waterproofing	Vitreous	170	2.4	510~5	72	400	485	Paste Size (D50) (μm)
AP5246B	SiO ₂ ·B ₂ O ₃ ·PbO	Excellent waterproofing	Vitreous	185	2.4	510~5	72	400	485	Particle Size (Center Value) (D50) (μm)
AP5246G	SiO ₂ ·B ₂ O ₃ ·PbO	Excellent waterproofing For solder joints	Vitreous	300	2.4	510~5	72	400	485	Average Particle Size (%6) (D50) (μm)
AP5346W	SiO ₂ ·B ₂ O ₃ ·PbO	Excellent waterproofing	Vitreous	150	2.4	510~5	72	400	485	Insulation Resistance (Ω)
AP5550	B ₂ O ₃ ·ZnO·PbO	High mechanical strength	Crystalline	150	2.8	550~5	47	455	540	tan δ (%6)
AP5551	B ₂ O ₃ ·ZnO·PbO	High mechanical strength	Crystalline	150	2.8	550~5	47	455	8~12	Breakdown Voltage (V)
										Sieving Size Mesh Pass
										Lead Free or Contd.

AP Dielectric Crossover Paste for Hybrid IC

Code	Glass Type	Paste and Fired Glass Feature	Glass Characteristics	Paste Specific Gravity (Pa·s)	Firing Condition (°C—min.)	Thermal Expansion Coeff. (X10 ⁻⁷ /°C.)	Viscosity Property (DTA) Softening Point (°C)	Color	Electrical Property	Particle Property
AP5555A	SiO ₂ ·B ₂ O ₃ ·RO	High density	Vitreous	180	—	800~10	105	500	620	Paste Size (D50) (μm)
AP5556B	SiO ₂ ·ZnO·PbO	High density	Crystalline	170	—	800~10	63	615	705	Particle Size (Center Value) (D50) (μm)
AP5556B	SiO ₂ ·ZnO·PbO	High density	Crystalline	170	—	800~10	63	615	705	Average Particle Size (%6) (D50) (μm)
AP5576	SiO ₂ ·ZnO·RO	High breakdown voltage	Crystalline	170	1.9	850~10	53	670	785	Insulation Resistance (Ω)
AP5576WE	SiO ₂ ·ZnO·RO	Excellent printing, High density	Crystalline	190	1.9	850~10	53	670	785	Fire Resistant
AP5577	SiO ₂ ·ZnO·RO	High breakdown voltage	Crystalline	170	1.9	850~10	53	670	785	Color
AP5578	SiO ₂ ·ZnO·RO	High breakdown voltage	Crystalline	170	1.9	850~10	53	670	785	tan δ (%6)
										Breakdown Voltage (V)
										Sieving Size Mesh Pass
										Lead Free or Contd.

AP Dielectric Paste for Multilayer Hybrid IC

Code	Glass Type	Paste and Fired Glass Feature	Glass Characteristics	Paste Specific Gravity (Pa·s)	Firing Condition (°C—min.)	Thermal Expansion Coeff. (X10 ⁻⁷ /°C.)	Viscosity Property (DTA) Softening Point (°C)	Color	Electrical Property	Particle Property
AP5700C	SiO ₂ ·ZnO·RO	High density	Partially	200	2.2	850~10	70	660	805	Paste Size (D50) (μm)
AP5701C	SiO ₂ ·ZnO·RO	High breakdown voltage	Partially	190	2.2	850~10	70	660	805	Particle Size (Center Value) (D50) (μm)
AP5707	SiO ₂ ·ZnO·RO	Minimal warping, High density, High breakdown voltage	Partially	180	2.2	850~10	75	685	900	Average Particle Size (%6) (D50) (μm)
										Insulation Resistance (Ω)
										Breakdown Voltage (V)
										Sieving Size Mesh Pass
										Lead Free or Contd.

AP Overcoat Glass Paste for Hybrid IC (Firing in N₂)

Code	Glass Type	Paste and Fired Glass Feature	Glass Characteristics	Paste Specific Gravity (Pa·s)	Firing Condition (°C—min.)	Thermal Expansion Coeff. (X10 ⁻⁷ /°C.)	Viscosity Property (DTA) Softening Point (°C)	Color	Electrical Property	Particle Property
AP5840N	SiO ₂ ·PbO	Excellent waterproofing, Excellent resolution	Vitreous	80	—	550~5	63	480	550	Paste Size (D50) (μm)
AP5841	SiO ₂ ·PbO	Excellent waterproofing, Excellent burn-out	Vitreous	50	—	600~5	60	450	585	Particle Size (Center Value) (D50) (μm)
										Average Particle Size (%6) (D50) (μm)
										Insulation Resistance (Ω)
										Breakdown Voltage (V)
										Sieving Size Mesh Pass
										Lead Free or Contd.

AP Dielectric Crossover Paste for Hybrid IC (Firing in N₂)

Code	Glass Type	Paste and Fired Glass Feature	Glass Characteristics	Paste Specific Gravity (Pa·s)	Firing Condition (°C—min.)	Thermal Expansion Coeff. (X10 ⁻⁷ /°C.)	Viscosity Property (DTA) Softening Point (°C)	Color	Electrical Property	Particle Property
AP5815C	SiO ₂ ·Al ₂ O ₃ ·RO	High density, High breakdown voltage	Partially	190	2.0	900~10	63	615	895	Paste Size (D50) (μm)
										Particle Size (Center Value) (D50) (μm)
										Average Particle Size (%6) (D50) (μm)
										Insulation Resistance (Ω)
										Breakdown Voltage (V)
										Sieving Size Mesh Pass
										Lead Free or Contd.

AP Dielectric Paste for Alumina Substrate Glazing of Print Head

Code	Glass Type	Paste and Fired Glass Feature	Glass Characteristics	Paste Specific Gravity (Pa·s)	Firing Condition (°C-min.)	Thermal Expansion Coeff. (X10 ⁻⁷ /°C)	Viscosity Property (DTA) Crystalization Point (°C)	Color	Electrical Property	Particle Property
AP5710	SiO ₂ ·Al ₂ O ₃ ·RO	High density	Crystalline	170	2.2	900~850~10	79	915	Orange	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.1
AP5710D	SiO ₂ ·B ₂ O ₃ ·RO	Excellent thermal conductivity	Vitreous	170	1.8	1200~1250~30~60	71	710	Orange	Fire Resistance (Ω) >10 ¹¹ ε >1000
AP5710D	SiO ₂ ·RO	For overall glaze	Vitreous	170	1.8	1200~1250~30~60	67	705	Clear	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.1
Characteristics										
● By controlling crystalline refraction, a smooth-surface glaze can be formed. (AP5710D, AP5710D)										

AP Overcoat Glass Paste for Print Head

Code	Glass Type	Paste and Fired Glass Feature	Glass Characteristics	Paste Specific Gravity (Pa·s)	Firing Condition (°C-min.)	Thermal Expansion Coeff. (X10 ⁻⁷ /°C)	Viscosity Property (DTA) Crystalization Point (°C)	Color	Electrical Property	Particle Property
AP5317	SiO ₂ ·B ₂ O ₃ ·RO	Excellent surface flatness	Vitreous	90	—	850~10	55	680	Gray	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.5
AP5317	Ph ₂ O·B ₂ O ₃ ·SiO ₂	Excellent surface flatness	Vitreous	120	2.4	810~10	70	475	White	Fire Resistance (Ω) >10 ¹¹ ε >2000
AP5318	Ph ₂ O·B ₂ O ₃ ·SiO ₂	High breakdown voltage	Vitreous	100	2.4	810~10	62	480	Gray	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.4
AP5319	Ph ₂ O·B ₂ O ₃ ·SiO ₂	High breakdown voltage	Vitreous	100	2.4	810~10	62	480	Gray	Fire Resistance (Ω) >10 ¹¹ ε >2000
AP5320	Ph ₂ O·B ₂ O ₃ ·SiO ₂	Excellent light blocking	Vitreous	100	2.4	810~10	65	480	Black	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.0
AP5514	SiO ₂ ·B ₂ O ₃ ·PbO	Excellent resistance to wear	Vitreous	30	1.9	780~10	45	495	White	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.0
AP5514F	SiO ₂ ·B ₂ O ₃ ·PbO	Excellent etch resistance	Vitreous	50	2.2	820~10	57	510	White	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.5
AP5515F	SiO ₂ ·B ₂ O ₃ ·PbO	Excellent surface flatness	Vitreous	70	2.1	810~10	51	615	White	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.5
AP5518	SiO ₂ ·PbO	Excellent surface flatness	Vitreous	70	2.4	830~10	58	535	White	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.5
AP5517	SiO ₂ ·ZnO·RO	Excellent resistance to wear	Vitreous	90	2.4	830~10	58	560	White	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.2
AP5318	SiO ₂ ·B ₂ O ₃ ·RO	For AlN coat	Crystalline	150	—	850~10	35	660	White	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.2
AP5319	SiO ₂ ·B ₂ O ₃ ·RO	High breakdown voltage	Vitreous	90	—	810~10	55	580	White	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.2
Developing Product										
S316A	SiO ₂ ·B ₂ O ₃ ·RO	Excellent surface flatness	Vitreous	80	—	810~10	55	580	Gray	Insulation Breakdown Voltage (V) >10 ¹¹ Ε tan δ (%) 1.5
Characteristics										
● Outstanding surface flatness, resistance to wear and heat resistance make them ideal as over coats for various kinds of print heads, including heaters, image sensors and thermal heads.										
● AP5514, AP5318 and AP5319 are for image sensors, and AP5518 is for thermal heads.										
● AP5317 and AP5317 are for AlN coat. (AP5317 : top layer, AP5317 : bottom layer)										

AP Primary Coat Glass Paste for Chip Resistor

Code	Glass Type	Paste and Fired Glass Feature	Glass Characteristics	Paste Specific Gravity (Pa·s)	Firing Condition (°C-min.)	Thermal Expansion Coeff. (X10 ⁻⁷ /°C)	Viscosity Property (DTA) Crystalization Point (°C)	Color	Electrical Property	Particle Property
AP5231	SiO ₂ ·PbO	Excellent acid-proof characteristics and stability of resistance	Vitreous	160	2.5	600~10	73	460	Green	Insulation Breakdown Voltage (V) >10 ¹⁰ Ε tan δ (%) 2.0

AP Second Coat Glass Paste for Chip Resistor

Code	Glass Type	Paste and Fired Glass Feature	Glass Characteristics	Paste Specific Gravity (Pa·s)	Firing Condition (°C-min.)	Thermal Expansion Coeff. (X10 ⁻⁷ /°C)	Viscosity Property (DTA) Crystalization Point (°C)	Color	Electrical Property	Particle Property
AP5231A	SiO ₂ ·B ₂ O ₃ ·PbO	Excellent acid-proof characteristics	Vitreous	300	—	600~5~10	66	470	White	Insulation Breakdown Voltage (V) >10 ¹⁰ Ε tan δ (%) 2.0
AP5231B	SiO ₂ ·B ₂ O ₃ ·PbO	Excellent acid-proof characteristics	Vitreous	100	—	600~5~10	66	470	Black	Insulation Breakdown Voltage (V) >10 ¹⁰ Ε tan δ (%) 2.0
AP5231B	SiO ₂ ·Ph ₂ O·B ₂ O ₃	Excellent acid-proof characteristics	Vitreous	210	—	590~5~10	64	475	Black	Insulation Breakdown Voltage (V) >10 ¹⁰ Ε tan δ (%) 2.0
AP5231C	SiO ₂ ·Ph ₂ O·B ₂ O ₃	Excellent acid-proof characteristics	Vitreous	170	—	600~5~10	75	465	Green	Insulation Breakdown Voltage (V) >10 ¹⁰ Ε tan δ (%) 2.0

AP Marking Glass Paste for Chip Resistor

Code	Glass Type	Paste and Fired Glass Feature	Glass Characteristics	Paste Specific Gravity (Pa·s)	Firing Condition (°C-min.)	Thermal Expansion Coeff. (X10 ⁻⁷ /°C)	Viscosity Property (DTA) Crystalization Point (°C)	Color	Electrical Property	Particle Property
AP5246WW	SiO ₂ ·Ph ₂ O	Excellent resolution	Vitreous	170	—	480~5~10	64	470	White	Insulation Breakdown Voltage (V) >10 ¹⁰ Ε tan δ (%) 1.7
AP521BW	SiO ₂ ·Ph ₂ O	Excellent resolution	Vitreous	150	—	480~5~10	64	475	White	Insulation Breakdown Voltage (V) >10 ¹⁰ Ε tan δ (%) 1.7
AP521BW	SiO ₂ ·Ph ₂ O	Excellent resolution	Vitreous	170	—	480~5~10	64	470	White	Insulation Breakdown Voltage (V) >10 ¹⁰ Ε tan δ (%) 1.7

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AP521BW	SiO ₂ ·B ₂ O ₃	Excellent resolution	Vitreous	170	—	480~5~10	64	475	White	Insulation Breakdown Voltage (V) >10 ¹⁰ Ε tan δ (%) 1.7
AP521BW	SiO ₂ ·B ₂ O ₃	Excellent resolution	Vitreous	150	—	480~5~10	64	470	White	Insulation Breakdown Voltage (V) >10 ¹⁰ Ε tan δ (%) 1.7
AP521BW	SiO ₂ ·B ₂ O ₃	Excellent resolution	Vitreous	170	—	480~5~10	64	470	White	Insulation Breakdown Voltage (V) >10 ¹⁰ Ε tan δ (%) 1.7

Glass Powder & Paste & Green-sheet for PDP

Sealing Glass Powder for Glass Panel, PD200 or AS (Soda Lime)

Code	ASF1304M	ASF1304Z	ASF1200M	ASF1200A	IWF2300M	DT430-150
Glass Characteristics	Crystalline		Vitreous		Vitreous	
Glass Type	B ₂ O ₃ ·PbO·ZnO		B ₂ O ₃ ·PbO		SiO ₂ ·B ₂ O ₃ ·PbO	
Thermal Expansion Coeff. (×10 ⁻⁵ /°C) ^{*1}	83	88	72	73	67	72
DTA Transformation Point (°C)	320	320	320	320	307	310
DTA Softening Point (°C)	400	400	390	380	353 ^{*2}	360 ^{*3}
DTA Crystallization Temp. (°C)	515	515	—	—	—	—
Flow Button Diameter (mm φ) ^{*4}	—	—	21	21	—	—
Color	Black	Black	Black	Black	Black	Black
Substrate Strain after Sealing (kg/cm ²) ^{*5}	-50~+50	-50~+50	-50~+50	-50~+50	—	—
Specific Gravity	6.1	6.1	5.8	5.8	7.2	7.2
Average Particle Size (μm) ^{*4}	4.0	4.0	5.0	5.0	—	—
Sieving Size (Mesh Pass)	150	150	150	150	—	—
Firing Condition (°C-min.)	450-30	450-30	450-10	450-10	430-10	430-10
Usage	PD200	AS	PD200	AS	PD200	AS

*1: 50~300°C/crystalline types, 50~250°C/vitreous type

*2: Fired at 450°C-10min. For vitreous, 450°C-30min. For crystalline, 12.8mm diam. Pre-pressed glass with the same specific gravity value

*3: "+": Frit compression, "-": Frit extension

*4: Air-permeability method

*5: Third inflection point on DTA curve

2004.April version

Dielectric Paste (Clear) for Front Panel, PD200

Code	YPT340	YPT05F
Glass Type	PbO·B ₂ O ₃ ·SiO ₂	PbO·B ₂ O ₃ ·SiO ₂
Color (After Firing)	Clear	Clear
Thermal Expansion Coeff. (×10 ⁻⁵ /°C) ^{*1}	75	74
DTA Transformation Point (°C)	490	460
DTA Softening Point (°C)	585	560
Paste Viscosity(Pa·S) ^{*2}	100~180	100~180
Firing Condition (°C-min.)	580-30	580-30
Usage	Sintered	Sintered

*1: Temperature range 50~350°C

*2: Brookfield rotary viscometer, 10rpm, 25°C

Rib Paste for PD200

Code	RPW401	RPW032
Glass Type	PbO·B ₂ O ₃ ·SiO ₂	PbO·B ₂ O ₃ ·SiO ₂
Color (After Firing)	White	White
Thermal Expansion Coeff. (×10 ⁻⁵ /°C) ^{*1}	73	73
DTA Transformation Point (°C) ^{*3}	460	450
DTA Softening Point (°C) ^{*3}	560	550
Paste Viscosity(Pa·S) ^{*4}	40~100	40~100
Firing Condition (°C-min.)	550~570-10	530~550-10
Usage	High Dense	High Dense

*1: Temperature range 50~350°C

*2: Brookfield rotary viscometer, 10rpm, 25°C

*3: Glass powder only

Dielectric Paste for Rear Panel, PD200

Code	AP5670
Glass Type	PbO·B ₂ O ₃ ·SiO ₂
Color (After Firing)	White
Thermal Expansion Coeff. (×10 ⁻⁵ /°C) ^{*1}	72
DTA Transformation Point (°C)	450
DTA Softening Point (°C)	560
Paste Viscosity(Pa·S) ^{*2}	100~180
Firing Condition (°C-min.)	560~570-10
Usage	For Under Rib

*1: Temperature range 50~350°C

*2: Brookfield rotary viscometer, 10rpm, 25°C

Dielectric Green Sheets for Rear Panel, PD200

Code	AGS7001
Glass Type	PbO·B ₂ O ₃ ·SiO ₂
Color (After Firing)	White
Thermal Expansion Coeff. (×10 ⁻⁵ /°C) ^{*1}	72
DTA Transformation Point (°C)	450
DTA Softening Point (°C)	560
Firing Condition (°C-min.)	560~580-30
Usage	For Under Rib

*1: Temperature range 50~350°C

*2: Brookfield rotary viscometer, 10rpm, 25°C

Dielectric Paste for Black Stripe

Code	AP5695(BMP065)
Glass Type	PbO·B ₂ O ₃ ·SiO ₂
Color (After Firing)	Black
Thermal Expansion Coeff. (×10 ⁻⁵ /°C) ^{*1}	90
DTA Transformation Point (°C)	455
Paste Viscosity(Pa·S) ^{*2}	70~130
Firing Condition (°C-min.)	580-30

*1: Temperature range 50~350°C

*2: Brookfield rotary viscometer, 10rpm, 25°C

AS Tube for Exhaustion

Item	AS Tube
Thermal Expansion Coeff. (×10 ⁻⁵ /°C) ^{*1}	87
Tube OD (mm φ)	5
ID (mm φ)	3

*1: Temperature range 50~350°C